

U.S. Application 09/619,560

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25. The process of claim 8, wherein at least one of the one or more by-products is ethylbenzene, 2,2-diphenylpropane or n-propylbenzene.
26. The process of claim 13, wherein at least one of the one or more by-products is ethylbenzene, 2,2-diphenylpropane or n-propylbenzene.

A marked-up version of the existing claims 1, 5, 10, 18, and 19 showing the changes incorporated in the amended claims is attached on a separate sheet.

REMARKS

Claims 1, 10, and 19 have been amended to limit percentages of the first and second crystalline molecular sieves to those percentages which are effective to decrease the concentration, relative to the weighted average of the performance of each of the crystalline molecular sieves alone, of any particular by-product with respect to the weight of monoalkylated aromatic compound produced, as measured at a given conversion of the polyalkylated aromatic compound. Support for these amendments is found in Table 1 of the specification (in which comparisons are shown at a DIPB conversion of approximately 50% achieved by varying WHSV while holding other conditions constant) and on page 15, line 12, through page 16, line 10, of the specification. Further a typo has been corrected in all three claims to change "a" to "an" preceding the word "X-ray."

Claims 5 and 18 have been amended to cover the percentages of the first crystalline molecular sieve separately from those of the second crystalline molecular sieve.

New claims 23 and 24 have been added to specify the percentages of the second crystalline molecular sieve separately from those of the first crystalline molecular sieve.

New claims 25 and 26 have also been added which specify some of the impurities specific to reactions producing cumene. Support for new claims 25 and 26 can be found in Table 1 and on page 15, line 12, through page 16, line 10, of the specification.

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Applicants respectfully request entry of this Amendment and reconsideration of this application, as amended.

Claims 1, 3 to 14 and 16 to 26 are presently pending in the application.

Rejection Under 35 USC 103(a)

Claims 1, 3 to 14, and 16 to 22 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kaufman (U.S. Patent No. 3,385,906) in view of Cheng et al (U.S. Patent No. 5,557,024). In particular, the Examiner argues that Kaufman teaches reaction of benzene with propylene in the presence of an alkylation catalyst to produce cumene-containing product from which is separated a majority of cumene. The remaining effluent is combined with benzene and transalkylated over a catalyst such as zeolite Y. Acknowledging that Kaufman fails to disclose the presently claimed process using a mixture of two different molecular sieves, claim 6's co-extrusion step, or the alkylation catalyst of claim 14, the Examiner relies on the Cheng reference for its disclosure of the use of MCM-22, MCM-49, zeolite Y, zeolite beta and mordenite, including TEA-mordenite, as transalkylation catalysts. According to the Examiner, it would have been obvious to one having ordinary skill in the art at the time of the invention to have modified the process of Kaufman by utilizing a combination of any two of the transalkylation catalysts disclosed by Cheng because each of these is individually used as transalkylation catalysts. The Examiner further argues i) co-extruding the catalyst as required by present claim 6, would have been obvious given Cheng's disclosure of extrusion as a common method for production of a catalyst, ii) using MCM-56 alkylation catalyst as disclosed by Cheng in transalkylation would have been obvious to one skilled in the art because of MCM-56's "high activity and selectivity for the desired alkylated product" and iii) one skilled in the art would have utilized small crystal (less than 0.5 micron) TEA-mordenite inasmuch as Cheng discloses its use as a transalkylation catalyst.

Kaufman teaches the use of zeolites such as faujasite, and zeolites L and Y, in transalkylation of benzene and by-products of benzene alkylation with propylene, but fails to disclose or suggest any of the presently claimed molecular sieves, much less the specific combinations of MCM-22 type material and zeolite beta or MCM-22 type

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material and mordenite, for which surprising results have been shown. Accordingly, it is respectfully submitted that one skilled in the art acquainted with Kaufman and Cheng (which also fails to suggest or disclose the present combinations of molecular sieve for the process now claimed) would not be led to the present invention. Moreover, neither of these references teaches nor suggests the unexpected improvements obtained by the combinations of molecular sieves in the process of the invention now claimed.

In response to applicants' arguments that the claimed process produces superior and unexpected results given the data provided in the Examples of the specification and in the Declaration by Dr. Jane Cheng, the Examiner argues that the showing made by the experimental data is not commensurate with the scope of the presently claimed invention inasmuch as the "claimed process is not limited to the specific ratios of the catalysts as described in the declaration" of Dr. Jane Cheng.

Finally, applicants respectfully submit that the present claims, inasmuch as they are restricted to effective percentages of the first and second crystalline molecular sieves, are commensurate in scope with that subject matter shown to provide unexpected results in the Examples. It is unexpected that a mixture of any two molecular sieve catalysts used in transalkylation reactions would exhibit an advantageous combination of properties as compared to the weighted average of the properties of each of the catalysts independently. Applicants have identified and claimed certain combinations of molecular sieve catalysts which are expected to result in such improvements. By limiting the claims to those combinations in those percentages which are effective to result in properties better than would normally be expected from such a mixture, applicants have limited the claims to be commensurate with the surprising results shown for the combinations tested.

Minimal experimentation would be required for one of ordinary skill in the art to choose molecular sieve catalyst mixtures or the percentages to use in order to optimize with respect to a given by-product at the desired operating conditions.

Applicants respectfully submit that the amendments to independent claims 1, 10, and 19 overcome the rejection under 35 U.S.C. § 103(a) and place this application in condition for allowance.

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Accordingly, it is respectfully urged that the Examiner withdraw this rejection in view of the claims as amended herein. Allowance of the present claims is therefore earnestly requested.

CONCLUSION

In view of the foregoing comments, entry of this Amendment and allowance of this application is earnestly solicited. Should the Examiner have any further comments or questions, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,

Date 3/10/03


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VERSION WITH MARKINGS TO SHOW CHANGES
MADE IN THE CLAIMS:

Please amend claims 1, 5, 10, 18, and 19 as follows:

1. [Three Times Amended] A process for producing a monoalkylated aromatic compound comprising the step of contacting a polyalkylated aromatic compound with an alkylatable aromatic compound under at least partial liquid phase conditions and in the presence of a transalkylation catalyst to produce a monoalkylated aromatic compound, wherein the transalkylation catalyst comprises a mixture of at least :
 - (i) a first crystalline molecular sieve having an X-ray diffraction pattern including d-spacing maxima at 12.4 ± 0.25 , 6.9 ± 0.15 , 3.57 ± 0.07 and 3.42 ± 0.07 Angstrom; and
 - (ii) a second crystalline molecular sieve different from the first molecular sieve and selected from zeolite beta and mordenite,

the percentage by weight of the first crystalline molecular sieve and the percentage by weight of the second crystalline molecular sieve in said transalkylation catalyst being percentages, based on the total weight of molecular sieve in the transalkylation catalyst, effective to reduce the concentration of any one or more by-products below the concentration of that by-product which is determined by calculating the linear weighted average of the concentrations of that by-product resulting from the use of each of the molecular sieves individually as a catalyst for transalkylation under the same conditions, excluding WHSV, all such concentrations being determined with respect to the weight of monoalkylated aromatic compound produced at a given conversion percentage of the polyalkylated aromatic compound.
5. [Twice Amended] The process of claim 1, wherein the transalkylation catalyst comprises about 15 to about 50% by weight of the first crystalline molecular sieve

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[and about 15 to about 50% by weight of the second crystalline molecular sieve,]
based on the total weight of molecular sieve material in the catalyst.

10. [Three Times Amended] A process for producing a monoalkylated aromatic compound comprising the steps of:
- (a) contacting an alkylatable aromatic compound with an alkylating agent in the presence of an alkylation catalyst to provide a product comprising said monoalkylated aromatic compound and a polyalkylated aromatic compound, and then
 - (b) contacting the polyalkylated aromatic compound from step (a) with said alkylatable aromatic compound under at least partial liquid phase conditions and in the presence of a transalkylation catalyst to produce a monoalkylated aromatic compound, wherein the transalkylation catalyst comprises a mixture of at least:
 - (i) a first crystalline molecular sieve having an X-ray diffraction pattern including d-spacing maxima at 12.4 ± 0.25 , 6.9 ± 0.15 , 3.57 ± 0.07 and 3.42 ± 0.07 Angstrom; and
 - (ii) a second crystalline molecular sieve different from the first molecular sieve and selected from zeolite beta and mordenite,
the percentage by weight of the first crystalline molecular sieve and the percentage by weight of the second crystalline molecular sieve in said transalkylation catalyst being percentages, based on the total weight of molecular sieve in the transalkylation catalyst, effective to reduce the concentration of any one or more by-products below the concentration of that by-product which is determined by calculating the linear weighted average of the concentrations of that by-product resulting from the use of each of the molecular sieves individually as a catalyst for transalkylation under the same conditions, excluding WHSV, all such concentrations being determined with respect to the weight of monoalkylated aromatic

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compound produced at a given conversion percentage of the polyalkylated aromatic compound.

18. [Twice Amended] The process of claim 10, wherein the transalkylation catalyst of step (b) comprises about 15 to about 50% by weight of the first crystalline molecular sieve [and about 15 to about 50% by weight of the second crystalline molecular sieve,] based on the total weight of molecular sieve material in the catalyst.
19. [Three Times Amended] A process for producing cumene comprising the steps of:
- (a) contacting benzene with propylene under at least partial liquid phase conditions and in the presence of an alkylation catalyst to provide a product comprising cumene and polyisopropylbenzenes, and then
 - (b) contacting the polyisopropylbenzenes from step (a) with benzene under at least partial liquid phase conditions and in the presence of a transalkylation catalyst to produce further cumene, wherein the transalkylation catalyst comprises a mixture of at least :
 - (i) a first crystalline molecular sieve having an X-ray diffraction pattern including d-spacing maxima at 12.4 ± 0.25 , 6.9 ± 0.15 , 3.57 ± 0.07 and 3.42 ± 0.07 Angstrom; and
 - (ii) a second crystalline molecular sieve different from the first molecular sieve and selected from zeolite beta and mordenite, the percentage by weight of the first crystalline molecular sieve and the percentage by weight of the second crystalline molecular sieve in said transalkylation catalyst being percentages, based on the total weight of molecular sieve in the transalkylation catalyst, effective to reduce the concentration of any one or more by-products below the concentration of that by-product which is determined by calculating the linear weighted average of the concentrations of that by-product resulting from the use of each of the molecular sieves individually as a catalyst for transalkylation

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under the same conditions, excluding WHSV, all such concentrations
being determined with respect to the weight of cumene produced at a
given conversion percentage of the polyisopropylbenzenes.

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